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AMENDMENTS TO THE CLAIMS

1. (CURRENTLY AMENDED) A method of doing surgical treatment with a tracking system in computer-assisted surgery for guiding an operator in inserting a femoral implant of a hip joint implant in a femur as a function of a limb length and orientation of the femoral implant, comprising:

obtaining a frame of reference of the femur, the frame of reference being trackable in space;

providing obtaining a digital model of a geometry of a femoral implant, and a digital model of a geometry of a tooling end of a rasp;

calculating a desired implant insertion for the femoral implant with respect to the frame of reference of the femur, as a function of the limb length; ~~and~~

~~guiding an operator in altering the femur for a subsequent insertion of the femoral implant in the femur by providing information about calculating alterations being made to a femur with a real-time tracking of the rasp altering the femur for receiving the femoral implant and with the digital model of the geometry of the tooling end of the rasp; and~~

determining a current implant insertion with respect to the desired implant insertion, the current implant insertion being calculated as a function of the digital model of the femoral implant and the alterations. ~~and of a real-time tracking of at least one surgical tool altering the femur for receiving the femoral implant.~~

2. (PREVIOUSLY PRESENTED) The method according to claim 1, wherein providing said information about the current implant insertion includes providing at least one of the varus/valgus angle of the femoral implant, the anteversion of the femoral implant, and an offset of the femoral implant.

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3. (PREVIOUSLY PRESENTED) The method according to claim 1, wherein guiding an operator in altering the femur is repeated following a change in the desired implant insertion caused by a change in an acetabular center of rotation.

4. (PREVIOUSLY PRESENTED) The method according to claim 1, further comprising guiding the operator in inserting the femoral implant in the intramedullary canal by tracking the femoral implant during the insertion.

5. (PREVIOUSLY PRESENTED) The method according to claim 1, wherein obtaining the frame of reference of the femur is intraoperative.

6. (PREVIOUSLY PRESENTED) The method according to claim 5, wherein the frame of reference of the femur includes a center of the femoral head, and obtaining the center of the femoral head is performed by:

 positioning a reference system trackable in space onto the femur;

 dislocating the femur from the pelvis;

 creating a digital model of a surface of the femoral head as a function of the reference system; and

 calculating a center of the femoral head as a function of the digital model of the surface of the femoral head.

7. (PREVIOUSLY PRESENTED) The method according to claim 6, wherein the frame of reference further includes femoral sagittal, frontal and transverse planes, and obtaining the planes is performed by:

 registering a sagittal plane with respect to said reference system by digitizing an anatomical axis of the

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femur, a midpoint of the epicondyles and a midpoint of a tibia corresponding to the femur, the anatomical axis and a midpoint of the malleoli lying in the sagittal plane;

registering a frontal plane with respect to said reference system, with the frontal plane being perpendicular to the sagittal plane and incorporating the anatomical axis; and

registering a transverse plane with respect to said reference system, with the transverse plane being perpendicular to the sagittal plane and the frontal plane.

8. (PREVIOUSLY PRESENTED) The method according to claim 5, wherein the frame of reference of the femur includes a center of the femoral head, and obtaining the center of the femoral head is performed by:

positioning reference systems trackable in space onto the femur and onto a corresponding pelvis;

registering a relative tracking value between said reference systems;

separating the femur from the pelvis to expose an acetabulum of the pelvis;

creating a digital model of a surface of the acetabulum as a function of the reference system;

calculating a center of rotation of the acetabulum as a function of the digital model of the surface of the acetabulum; and

calculating a center of rotation of the femoral head as a function of said relative tracking value between said reference systems, assuming that the center of rotation of the acetabulum is coincident with the center of rotation of the femoral head.

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9. (PREVIOUSLY PRESENTED) The method according to claim 8, wherein the frame of reference further includes femoral sagittal, frontal and transverse planes, and obtaining the planes is performed by:

registering a sagittal plane with respect to said reference system by digitizing an anatomical axis of the femur, a midpoint of the epicondyles and a midpoint of a tibia corresponding to the femur, the anatomical axis and a midpoint of the malleoli lying in the sagittal plane;

registering a frontal plane with respect to said reference system, with the frontal plane being perpendicular to the sagittal plane and incorporating the anatomical axis; and

registering a transverse plane with respect to said reference system, with the transverse plane being perpendicular to the sagittal plane and the frontal plane.

10. (PREVIOUSLY PRESENTED) The method according to claim 2, wherein the varus/valgus angle of the femoral implant is calculated as a function of an axis of the intramedullary canal in relation to an axis of the femoral implant with respect to the frame of reference, and obtaining the axis of the intramedullary canal is performed by:

performing an opening in the femur;

providing a tool trackable in space, said tool having a leading end thereof being insertable in a determined way with respect to a surface of the intramedullary canal; and

obtaining the axis of the intramedullary canal with respect to the frame of reference by calculating and relating reference points in the intramedullary canal by inserting the leading end of the tool at given depths in the intramedullary canal and calculating a reference point of the intramedullary canal for each said given depths as a function of a tracking

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of said tool having the leading end inserted in said determined way.

11. (WITHDRAWN) A method of doing surgical treatment in computer-assisted surgery for guiding an operator in inserting a pelvic implant of a hip joint implant in an acetabulum of a pelvis as a function of a position and orientation of the pelvic implant with respect to the pelvis, comprising the steps of:

- creating a frame of reference of a pelvis by registering points on the pelvis, the frame of reference being trackable in space for position and orientation;

- creating a digital model of a surface of an exposed acetabulum of the pelvis by registering points on the surface of the acetabulum as a function of the frame of reference;

- providing a digital model of a pelvic implant;

- calculating an initial center of rotation of the acetabulum as a function of the digital model of the surface of the acetabulum; and

- guiding an operator in altering the acetabulum for a subsequent insertion of the pelvic implant in the acetabulum by providing information about a current implant position and orientation with respect to the initial center of rotation of the acetabulum and the frame of reference, the current implant position and orientation being calculated as a function of the digital model of the pelvic implant and of a real-time tracking for position and orientation of at least one surgical tool altering the acetabulum for receiving the pelvic implant.

12. (WITHDRAWN) The method according to claim 11, wherein said information about the current implant position and orientation includes at least one of the anteversion of the pelvic implant, and the inclination of the pelvic implant.

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13. (WITHDRAWN) The method according to claim 11, further comprising a step of guiding the operator in inserting the pelvic implant in the acetabulum by tracking a position and orientation of the pelvic implant during the insertion.

14. (WITHDRAWN) The method according to claim 11, wherein a step of tracking postures of a patient is performed pre-operatively, the tracking of postures being selectively used by the operator to orient the frame of reference in the step of creating a frame of reference of the pelvis.

15. (WITHDRAWN) The method according to claim 11, wherein said points registered in the step of creating a frame of reference of the pelvis include a point on each anterior iliac crest and a point on a pubis tubercle, said points lying in a frontal plane of the frame of reference, a transverse plane being perpendicular to the frontal plane and incorporating said points on the anterior iliac crests, and a sagittal plane being perpendicular to the frontal plane and the transverse plane.

16. (WITHDRAWN) The method according to claim 11, further comprising a step of calculating at least one of an anteversion and an inclination of the acetabulum with respect to the frame of reference.

17. (WITHDRAWN) A computer-assisted surgery system for guiding an operator in inserting a femoral implant of a hip joint implant in a femur as a function of a limb length and orientation of the femoral implant with respect to the femur, comprising:

a reference tool positionable onto the femur and trackable in space for position and orientation;

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a registration tool trackable in space for position and orientation and handled by the operator to register surface information;

a bone altering tool trackable in space for position and orientation;

a sensing apparatus, for tracking any one of the tools for position and orientation;

a controller connected to the sensing apparatus, the controller being provided to:

i) register a frame of reference of the femur by at least one of calculating surface information provided by the registration tool as a function of the position and orientation of the registration tool provided by the sensing apparatus, and retrieving in a database a model of the femur;

ii) calculate a desired implant position with respect to the frame of reference as a function of the limb length; and

iii) calculate a current implant position and orientation in relation to the desired implant position with respect to alterations being performed in the femur with the bone altering tool, as a function of the position and orientation of the bone altering tool provided by the sensing apparatus and of a digital model of a femoral implant provided by the database; and

the database connected to the controller for the controller to store and retrieve information relating to an operation of the controller.

18. (WITHDRAWN) The computer-assisted surgery system according to claim 17, wherein the current implant position and orientation is provided as at least one of the varus/valgus angle of the femoral implant, the anteversion of the femoral implant as a function of the frame of reference, and an offset of the femoral implant.

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19. (WITHDRAWN) The computer-assisted surgery system according to claim 17, wherein step iii) is repeated by the controller following a change in the desired implant position caused by a change in an acetabular center of rotation.

20. (WITHDRAWN) The computer-assisted surgery system according to claim 17, wherein the controller further performs a step of iv) calculating a position and orientation of the femoral implant as a function of a tracking for position and orientation of the femoral implant.

21. (WITHDRAWN) The computer-assisted surgery system according to claim 17, wherein the frame of reference of the femur includes the center of rotation of the femoral head and the surface information is a surface of the femoral head, the center of the femoral head being calculated by the controller as a function of the surface of the femoral head.

22. (WITHDRAWN) The computer-assisted surgery system according to claim 17, wherein the frame of reference of the femur includes the center of rotation of the femoral head and the surface information includes a surface of a corresponding acetabulum, the center of rotation of the femoral head being calculated by the controller as a function of a relative position and orientation between the femur and the pelvis, and of an assumption that the center of rotation of the acetabulum is coincident with the center of rotation of the femoral head.

23. (WITHDRAWN) The computer-assisted surgery system according to claim 21, wherein the frame of reference further includes femoral sagittal, frontal and transverse planes, and said surface information further includes an anatomical axis of the femur, a midpoint of the epicondyles and a midpoint of the

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malleoli, the sagittal plane being registered by the controller as incorporating the anatomical axis and the midpoint of the malleoli, the frontal point being registered by the controller as incorporating the anatomical axis and as being perpendicular to the sagittal plane, and the transverse plane being registered by the controller as being perpendicular to the sagittal plane and the frontal plane.

24. (WITHDRAWN) The computer-assisted surgery system according to claim 18, wherein the varus/valgus angle is calculated between an axis of the femoral implant and an intramedullary canal of the femur with respect to the frame of reference, the intramedullary canal being registered by relating reference points in the intramedullary canal.

25. (WITHDRAWN) A computer-assisted surgery system for guiding an operator in inserting a pelvic implant of a hip joint implant in an acetabulum as a function of an orientation of the pelvic implant with respect to the pelvis, comprising:

- a reference tool securable to the pelvis and trackable in space for position and orientation;

- a registration tool trackable in space for position and orientation and handled by the operator to register surface information;

- a bone altering tool trackable in space for position and orientation;

- a sensing apparatus, for tracking any one of the tools for position and orientation;

- a controller connected to the sensing apparatus, the controller being provided to:

- i) register a frame of reference of the pelvis with respect to the reference tool by calculating surface information provided by the registration tool as a function of

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the position and orientation of the registration tool provided by the sensing apparatus;

ii) register a digital model of a surface of an exposed acetabulum of the pelvis with respect to the frame of reference by calculating surface information provided by the registration tool as a function of the position and orientation of the registration tool provided by the sensing apparatus;

iii) calculate an initial center of rotation of the acetabulum as a function of the digital model; and

iv) calculate a current implant position and orientation in relation to the initial center of rotation of the acetabulum and the frame of reference with respect to alterations being performed in the acetabulum with the bone altering tool, as a function of the position and orientation of the bone altering tool provided by the sensing apparatus and of a digital model of an acetabular implant provided by the database; and

the database connected to the controller for the controller to store and retrieve information relating to an operation of the controller.

26. (WITHDRAWN) The computer-assisted surgery system according to claim 25, wherein the current implant position and orientation is provided as at least one of the anteversion of the pelvic implant, and the inclination of the pelvic implant.

27. (WITHDRAWN) The computer-assisted surgery system according to claim 25, wherein the controller further performs a step of v) calculating a position and orientation of the pelvic implant as a function of a tracking for position and orientation of the pelvic implant.

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28. (WITHDRAWN) The computer-assisted surgery system according to claim 25, wherein said surface information calculated in the step of registering a frame of reference of the pelvis by the controller include a point on each anterior iliac crest and a point on a pubis tubercle, a frontal plane being registered by the controller as incorporating said points, a transverse plane being registered by the controller as being perpendicular to the frontal plane and as incorporating said points on the anterior iliac crests, and a sagittal plane being registered by the controller as being perpendicular to the frontal plane and the transverse plane.